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TITLE: Computer method and apparatus for optimizing portfolios of multiple participants

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PRIOR-ART-DISCLOSED:

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Search Selected Search ALL Clear

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Introducing a New Way to Trade, Optimark.

ART-UNIT: 2163

PRIMARY-EXAMINER: Hafiz; Tariq R.

ASSISTANT-EXAMINER: Meinecke-Diaz; Susanna

ATTY-AGENT-FIRM: Pennie & Edmonds LLP

ABSTRACT:

Computer technology for substantially optimizing portfolios of multiple participants is disclosed. Preferably the portfolios of such multiple participants comprise fixed income instruments. The disclosed systems and methods include using at least one computer system for storing digital data representing portfolio holdings of multiple parties and, in particular, for each participant storing in the computer memory data representing constraints with respect to the desired portfolio. The method and system comprise optimizing using an optimization engine portfolio and constraint information of multiple participants so as to generate a set of trades that would substantially optimize participants portfolios with respect to a known objective.

26 Claims, 4 Drawing figures

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Brief Summary Text (13):
In addition, individual firms typically have portfolio composition constraints that must remain satisfied in any intermediated transaction implemented by the system. Such constraints may include fixed market value of holdings within given sectors and maximum holdings of given names. The implementation of the preferred embodiment provides means for satisfying such constraints.

Detailed Description Text (17):
A tax swap is beneficial if tax refunds received today have positive economic value considering the present values of the bonds swapped to achieve the refund. If two firms own underwater bonds (i.e., bonds which values have dropped in comparison to their original values), swapping such bonds for bonds owned by others may enable the firms to take advantage of the tax refund. Tax-related advantages can, for example, result from swapping an underwater bond with a par bond and with a discount bond as discussed below.

Detailed Description Text (32):
Present value neutrality: for every firm, the total of all trades must be present-value neutral. ##EQU3##

Detailed Description Text (36):
Other market-value weighted attributes: Yield and rating are constrained in an identical manner as duration and convexity. In other embodiments, other portfolio characteristics can be defined in a manner similar to duration and convexity.

Detailed Description Text (37):
Par-value weighted attributes: Maturity and coupon are constrained in a manner similar to duration and convexity; however, par-value rather than market-value is used for weighing. As noted, in other embodiments, other characteristics can be similarly defined.

Detailed Description Text (38):
Proceeds bounding within sectors: The total of all trades must leave the present value (within every sector) between reasonable (predefined) bounds. These constraints can enforce present-value-neutral trading, possibly weakened to provide additional flexibility. Alternately, the use of these constraints may provide an opportunity to employ the transaction in order to reallocate the portfolio. These constraints, expressed below, are applied on a per party (j) basis. ##EQU5##

Detailed Description Text (45):
The formulation of the objective function, provided above, maximizes achieved book loss. In an alternative embodiment, this function can be generalized as follows to include the economic value of tax deferral: ##EQU8##

Detailed Description Text (94):

value: one of

Detailed Description Text (111):
numerator-value:

Detailed Description Text (112):
value

Detailed Description Text (113):
value numerator-value

Detailed Description Text (118):
numerator-value numerator-variable

Detailed Description Text (119):
denominator-value:

Detailed Description Text (120):
value

Detailed Description Text (121):
value denominator-value

Detailed Description Text (126):
denominator-value denominator-variable

Detailed Description Text (140):
The base statistic is defined by both variable and value specifications. For example, if a firm is interested in constraining the market-value-weighted dollar duration of all bonds it buys, the numerator is set to #PV#DUR#BUY. The variable #BUY specifies that the set of bonds bought should be considered. The values #PV#DUR specify that the desired statistic is present value times duration times par amount.

Detailed Description Text (141):
Other variables that can be used are #SELL (bonds sold), #NET (buys minus sells), #SECTOR (pay attention to the sectors specified in the constraint), #ALL (ignore sectors), #FINAL (original plus buys minus sells), and #AVG (buys plus sells divided by two). These variables can also be combined as in the example above. The values include #CONV (convexity), #MAT (maturity), #COUPON (coupon), #RATING (rating) and #LOSS (book price minus price), as well as other values defined by the user, as will be understood by one skilled in the art.

Detailed Description Text (143):
Commonly used constraints may also be specified as macros. Constraints can be bound with respect to #ABS (absolute value of bounds), #REL (a value relative to a base value, i.e., base value.+-.percentage points), and #PROP (proportional values, i.e., base value multiplied by percentages; the base value is always computed from the incoming portfolios).

Detailed Description Text (145):
Here the zero lower bound guarantees that the original convexity cannot be lower than the resulting convexity. The large upper bound indicates that convexity is allowed to increase up to 1000% of the original value (essentially unlimited).

Detailed Description Text (151):
First the yields of currently traded US Treasuries are determined as known in the art. Instead of using all US Treasury prices, only the on-the-run prices are used. First, the closing prices of every UST and the market prices of all the on-the-runs are collected. Second, a butterfly portfolio for each UST is constructed using the

two on-the-runs with the closest durations as barbells. Third, the change in the current present value of each UST is determined by that of the two ends of the barbell, taking into account the butterfly weights.

Detailed Description Text (161):
If the bond is constrained, the program determines the proper coefficient a.sub.i for each linear programming variable associated with the bond. A bond has BUY and SELL linear programming variables. Integer linear programming variables are also employed, for example, to prevent churning, wash sales, and ensure group exclusion. The numerator's value specification is used to compute a.sub.i, for example, #PV#DUR indicates that the coefficient a.sub.i is computed as the bond's present value times duration. The par amount is contributed by the value of the linear programming variable x.sub.i.

Detailed Description Text (168):
One such approach to achieving fairness that may be used in an alternative embodiment is to employ a method developed by Shapley for constructing a "fair" solution to the classic coalition problem in game theory. See H. Raiffa, The Art and Science of Negotiation, Harvard University Press, Cambridge, 1982, incorporated herein by reference. The general problem considered by Shapley involves n players, each subgroup of which has a given, fixed utility. Usually the largest subgroup, i.e., the entire group, generates greater utility than any other partitioning of the players. The problem addressed by Shapley is to divide the gains among the players so that they all cooperate in a single large coalition rather than splitting apart into cliques. Shapley values give such a division based on fundamental principles, e.g., linear composition of solutions and no payments to players who contribute nothing.

Detailed Description Text (169):
In formulating a tax swap as a coalition problem, the majority of a subgroup's utility is attributed by its tax loss, which can be evaluated with the optimizer for each subgroup. Two additional factors contributing to utility include: 1) a consideration that discount securities (priced below par), purchased in the swap, have a smaller future tax burden than par or premium securities, so that all players wish to swap in discount securities; and 2) by swapping among themselves, the firms have less total transaction costs than the market would charge, especially considering premiums due to the inelasticity of supply of discount bonds. Once these considerations are factored into the subgroup utilities, Shapley values can be computed, to determine a fair division of proceeds.

Detailed Description Text (171):
where a.sub.j >0 is a constant assigned to firm j in order to control the relative value of its book losses to the overall optimization.

Detailed Description Text (173):
Individual parties must be prevented or at worst dissuaded from "cherry picking" prices or securities, i.e., viewing the optimized trades and selectively committing to only certain trades. For example, a party which avoids an assigned buy trade that is perceived as too expensive is hoping to engage in a form of arbitrage. That party wants to buy at no worse than fair value, but of course does not identify the bonds it is selling above fair value.

Detailed Description Paragraph Table (3):
TABLE 3 Basic Variable Definitions symbol meaning variables BUY.sub.i,j par amount of bond i bought by firm j SELL.sub.i,j par amount of bond i sold by firm j constant inputs CURPAR.sub.i,j original par amount of bond i held by firm j PRICE.sub.i,j firm j's transaction price for bond i BOOK.sub.i,j firm j's book price for bond i ACCRUED.sub.i accrued interest for bond i PV.sub.i,j PRICE.sub.i,j + ACCRUED.sub.i (firm j's transaction cost for bond i) DUR modified-present-value duration for bond i CON.sub.i present-value convexity for bond i IN.sub.i,j,k bond

i belongs to firm j's k-th sector (0, 1)

Field of Search Class/SubClass (2):
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US Reference US Original Classification (1):
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US Reference Group (1):
4346442 19820800 Musmanno 705/36

US Reference Group (2):
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US Reference Group (29):
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Other Reference Publication (9):
Adamidou et al., The Optimal Portfolio System: Targeting Horizon Total Returns Under Varying Interest-rate Scenarios.

CLAIMS:

9. The method of claim 6 wherein the user constraints including digital data representing par-value weighted attributes.

22. The method of claim 21 wherein the objective function includes data representing economic value of tax deferral.